

WASHINGTON STATE
DEPARTMENT OF
E C O L O G Y

**CLEANUP ACTION PLAN
HANSVILLE GENERAL STORE
HANSVILLE, WASHINGTON**

DRAFT – FOR PUBLIC COMMENT

Prepared by

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LIST OF ACRONYMS

ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, xylene
DRO	diesel-range organics (petroleum hydrocarbons)
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
FS	Feasibility Study
ft	feet
GRO	gasoline-range organics (petroleum hydrocarbons)
mg/kg	milligram per kilogram
MTCA	Model Toxics Control Act
MW	monitoring well
RCW	Revised Code of Washington
RI	Remedial Investigation
SVE	soil vapor extraction
TEE	terrestrial ecological evaluation
TPH	total petroleum hydrocarbons
ug/L	microgram per liter
UST	underground storage tank
WAC	Washington Administrative Code

DECLARATIVE STATEMENT

Consistent with the Model Toxics Control Act, Chapter 70.105D RCW, as implemented by the Model Toxics Control Act Cleanup Regulation, Chapter 173-340 WAC, it is determined that the selected cleanup actions are protective of human health and the environment, attain federal and state requirements that are applicable or relevant and appropriate, comply with cleanup standards, provide for compliance monitoring, use permanent solutions to the maximum extent practicable, provide for a reasonable restoration time-frame, and consider public concerns raised during public comment.

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Date

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1.0 INTRODUCTION

1.1 GENERAL FACILITY INFORMATION

Site Name: Hansville General Store
Property Address: 7532 NE Twin Spits Road, Hansville, Washington 98340

Facility Site Identification No.: 2621
Consent Decree No.: 92 2 01398 5
Effective Date of Decree: July 16, 1992

Project Coordinator: Mark Adams, Ecology
Project Coordinator Address: 3190 160th Avenue SE, Bellevue, WA 98008
Project Coordinator Phone Number: (425) 649-7107

Current Owner: Gary and Joanne Erickson
Legal Description of the Facility:

16282E ,LOT 3, SECTION 16, TOWNSHIP 28 NORTH, RANGE 2 EAST, W.M., DESCRIBED AS FOLLOWS: BEGINNING AT A POINT WEST 31.64 FEET AND N0*4'E 1064.10 FEET FROM THE SOUTHEAST CORNER OF LOT 3; THENCE S0*4'W 148.60 FEET TO A POINT OF INTERSECTION WITH LUNDBERG ROAD NO. 325; THENCE N54*12'W 185 FEET; THENCE N35*48'E 140 FEET; THENCE S43*2'40 E 100.11 FEET TO BEGINNING; EXCEPT 20 FEET ON THE EAST AND SOUTH BOUNDARIES FOR ROAD, INCLUDING PART OF VACATED STREET.

1.2 PURPOSE OF CLEANUP ACTION PLAN

In December 1989, petroleum hydrocarbons were discovered on the adjacent property to the east (known as Forbes Landing, and later Captains Landing). The adjacent party notified the store owners and Ecology of this release by letter on November 26, 1990.

Ecology subsequently negotiated the Consent Decree, referenced above, with the owner of the store property, and assumed direction and funding of the cleanup. The Decree indicates that cleanup shall continue until cleanup standards are achieved in accordance with MTCA regulations.

The purpose of this report is to satisfy the requirements of Chapter 173-340 Washington Administrative Code (WAC) and the Consent Decree (the Decree) with respect to the preparation of a cleanup action plan (CAP) for the Site.

The purpose of a CAP is to establish the actions that will be taken to clean up a site, and to provide sufficient direction for engineering plans and specifications.

1.3 SITE LOCATION AND DEFINITION

The Site is defined, for purposes of the CAP, as the volumetric area of gasoline- and diesel-range petroleum hydrocarbons released to soil, ground water, and surface water as a result of

operations at the Hansville General Store. The area of contamination, and hence the Site, occupies a portion of the store property and extends southward across a road onto adjoining property. It also extends eastward onto adjoining property. Figures 1, 2, and 3 show the Site location and approximate boundaries.

Note that the definition of the Site is different in the Consent Decree. In that document it is defined as the property and business known as "the Hansville General Store".

The Site is located on Norwegian Point, which borders Admiralty Inlet at the extreme northern end of the Kitsap peninsula. Hood Canal borders the peninsula on the west and Admiralty Inlet borders it on the north and east, as shown on Figure 1. Admiralty Inlet is the main avenue for marine traffic from the Strait of Juan de Fuca into Puget Sound.

The specific location of the Site is at and near the Hansville General Store property (the store property or the Property) at 7532 NE Twin Spits Road (the road or Twin Spits Rd), as shown on Figure 3.

1.4 SITE DESCRIPTION

The area around the Site is known as Hansville, and is an unincorporated part of Kitsap County. Hansville comprises a very small cluster of existing and defunct businesses and a church on the shoreline of Admiralty Inlet. Residential properties extend northwest from the store property, and a large area of wetland/salt marsh occurs landward of the business area (see Figure 2). Residential housing also extends eastward along the shoreline towards Point No Point, a Kitsap County park. Across the road from the store is the Hansville Community Church and former fire station (now part of the church).

Twin Spits Rd., running in front of the store, is the northern extension of Hansville Road NE, one of two main access roads to the northern end of Kitsap County. As such Twin Spits Rd. is an important arterial for this rural area.

An 8-inch diameter asbestos concrete potable water pipeline extends through the Site along Twin Spits Rd. The pipe location is shown on Figure 4. This pipe is one of Kitsap Public Utilities District's (PUD) water mains, and provides domestic water to homes and businesses south of the Site and to all homes west of the store to the end of the peninsula.

No public sewerage facilities exist in the area. Individual or group septic systems are the means for disposing of sanitary waste. Because of the shallow water table at and near the Site, above-ground mound type systems are common.

The Site and surrounding area is situated on a raised marine terrace bordering the beach at Pigeon Point. The area was reportedly a salt marsh before development filled some areas and cut off most of the tidal flow. The terrace surface is flat, at a few feet above sea level, and extends landward from the beach a maximum distance of about ½ mile. Steep to moderate slopes then rise inland towards the center of the peninsula. Along the edge of the shoreline, the land surface is a few feet higher than the terrace.

Surface water drainage in the wetland is through a series of dug ditches, which discharge to Admiralty Inlet via several culverts west of the store. There are also a series of catch basins and drainage ditches along Hansville Rd west of the store which direct surface water to the culverts.

Surface water drainage at the store property is via overland flow and direct infiltration. Immediately south of the store is a deep ditch on the east side of Hansville Road NE. The ditch ends at the point where Hansville Road curves to meet Twin Spits Rd (see Figure 3), and extends south along Twin Spits Rd. This ditch flows year-round and collects both ground water seepage and storm water runoff from areas to the south. Water in the ditch discharges to Admiralty Inlet via a buried 36-inch diameter concrete pipe that is open to the tide. Flow reversal occurs in the pipe during high tide, and water levels rise in the ditch. A similar flow reversal occurs in a culvert west of the store, such that sea water flowing landward enters into the wetland/salt marsh.

Shallow geologic conditions at the Site consist of a few feet of mixed fill, overlying native sand. The sands are likely recent marine sediments deposited on the marine terrace prior to uplift. Older dense glacial or inter-glacial sediments likely underlie the recent marine sediments at relatively shallow depth.

Shallow ground water at the Site occurs as an unconfined fresh water aquifer within the sands. The depth to water is typically 3 to 5 feet below land surface.

Conductivity measurements obtained from the shallow waters showed a range of 160 to 400 umhos/cm; these values are indicative of fresh, non-saline conditions. However, it is very possible that saline ground water occurs below the fresh water at shallow depth, reflecting either the geologic origin of the sands or salt water intrusion.

Ground water flow at the Site is generally towards the shoreline, as would be expected. Actual flow directions are quite variable depending on the tide and the degree to which water backs up in the Hansville Road ditch. During high tides, ground water/surface water levels increase in the ditch and wetland area south of the Site diverting flow at the Site to the northeast. As the tide lowers, ground water flow at the Site veers southward. At lowest tides, it appears ground water at the Site may be discharging into the ditch and/or into more permeable zones along the concrete culvert outlet to Admiralty Inlet.

No habitat survey has been completed, but excellent quality habitat is present in close proximity to the Site. Not only are there the large areas of wetland described previously, but the area is rural with large areas of forest. Several parks also exist within about 1/2 mile, each with areas of wetland and/or forest. These habitat areas likely support terrestrial wildlife populations.

2.0 CLEANUP REQUIREMENTS

2.1 NATURE AND EXTENT OF CONTAMINATION

The Hansville General Store apparently opened sometime before 1934 as a farmer's cooperative. Between 1934 and 1988, it operated as a general store, with retail gasoline and diesel sales. Two 1,000 gallon USTs supplied a fuel pump located above the tanks. In 1988, the store stopped pumping gas, and the two USTs were left in place and filled with concrete. Leaks and spills associated with the former fuel pump and USTs appear to have been the source of the gasoline and diesel contamination found at the store property.

Contamination was also detected on the Captain's Landing property associated with two 500-gallon USTs and one 2,000-gallon UST. Analytical data obtained during excavation and removal of the USTs indicated that contamination associated with these sources may have overlapped contamination originating from the Hansville store sources. Both gasoline and diesel-range hydrocarbons were detected in soil and ground water near the border of these properties.

Gasoline and diesel-range hydrocarbons (GRO and DRO), and BTEX compounds have been detected in soil as mentioned previously. The maximum concentrations detected include GRO up to about 18,000 mg/kg and DRO up to about 13,000 mg/kg. The two hydrocarbon ranges are coexistent and extend across an area measuring approximately 200 feet by 60 feet in plan dimension. The vertical extent of contamination is limited by the water table; the maximum depth is therefore expected to be about 7 feet.

One sample of sediment was obtained from the north end of the Hansville Rd ditch, at a location that potentially received ground water discharge from the Site. The sample was analyzed for GRO, DRO, ORO, BETX, and lead, and nothing was detected except about 3 mg/kg lead.

Soil vapor concentrations have not been measured at the Site, but OVA field measurements obtained as recently as 2005 showed over 2000 ppm volatile organics in one hand auger boring (HA10) and readings in the hundreds in two others (HA3, HA9). The borings with the highest readings were all located adjacent to the southern border of the general store. These data suggest the potential for contaminated soil vapor.

Shallow ground water contamination detected at the Site mirrors the nature and extent of contaminants detected in soil. The affected ground water area is wider and longer than the affected soil area, but has the same general shape and the same type of contaminants. One caveat is that much of the ground water data comes from grab samples collected from hand auger borings. Actual concentrations in ground water are likely less, and perhaps considerably less, than the recorded detections. Another caveat is that water quality data has been collected over a period of 15 years. Current contaminant concentrations should be lower.

No surface water data are available. It is unlikely contaminants from the Site would be detectable in the Hansville Road ditch or in Admiralty Inlet given the vigorous tidal flushing that occurs in these areas.

2.2 CLEANUP STANDARDS

Soil contamination at the Site is shallow, within a few feet of the ground surface, and land use in the immediate area includes commercial, recreational, residential, and terrestrial habitat uses. As a consequence, soil cleanup levels need to be protective of the following exposure pathways:

- Human direct contact/ingestion
- Vapor intrusion
- Leaching to ground water
- Terrestrial species direct contact/ingestion

Air cleanup levels are also needed for this Site because of the potential for vapor intrusion into the store building and other buildings in the area.

The highest beneficial use for ground water under MTCA is potable to protect drinking water uses. For this Site however, ground water is in close proximity to marine waters, and a shallow water supply well installed in the area could not be pumped without significant risk of sea water intrusion. Ground water at the Site therefore meets the exclusion from potable beneficial use under WAC 173-340(2)(d).

Other beneficial uses for ground water include discharge to surface water and other potential exposure pathways include volatilization from contaminated ground water. Ground water CULs are needed to protect surface water beneficial uses and soil vapor.

Table 2.2-1 summarizes ground water cleanup levels protective of marine water and soil vapor intrusion selected in the RI/FS.

Table 2.2-1
Summary of Cleanup Levels and Points of Compliance

CUL Source	GRO	DRO	ORO	Benzene	Toluene	Ethyl-benzene	Xylenes
Soil mg/Kg	30	200	200	.03	7	6	9
Air ug/m ³	none	none	none	.32	2,200	460	46
Ground Water ug/L	800	500	500	5	1,000	700	1,000
Point of Compliance	Soil	Throughout the Site					
	Air	Ambient air throughout the Site					
	Ground Water	Throughout the Site					

2.3 AREAS REQUIRING CLEANUP

The approximate Site boundary is shown on Figure 4a and the associated property ownership on Figure 4b. The area requiring soil cleanup is within the Site boundary as shown on Figure 12 in the RI/FS report, and extends from the Property onto three neighboring properties: Kitsap County parks (Captains Landing), Kitsap County road right-of-way (Twin Spits Rd), Roger and Beata Nelson, and possibly the church property.

The cleanup area covers part of the 1994 excavation, which contains backfill not needing cleanup. The area also extends some unknown distance beneath the general store building. In most of the soil cleanup area, the zone of contamination is likely to be at and near the water table from 4 to 7 feet below ground surface. Soils above this depth likely do not contain hydrocarbons at concentrations exceeding cleanup levels.

The estimated area of ground water contamination is larger than the area of soil cleanup, as also shown on Figure 12. Because the boundaries of this area were determined largely on the basis of ground water grab sample data, the actual area requiring cleanup is likely to be less.

2.4 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

MTCA requires that cleanup actions comply with applicable state and federal laws [WAC 173-340-360(2)]. MTCA defines applicable state and federal laws to include “legally applicable requirements” and “relevant and appropriate requirements” (ARARS). ARARS for the implementation of the cleanup action at this site follow.

Federal Requirements

- Clean Water Act (33 United States Code (USC) 1251 et seq.)
- Resource Conservation and Recovery Act (RCRA)
- Occupational Safety and Health Act (29 CFR 1910)
- Safe Drinking Water Act
- Rules for Transport of Hazardous Waste (49 CFR 107, 49 CFR 171)

State Requirements

- Model Toxics Control Act Regulations (WAC 173-340)
- Dangerous Waste Regulations (WAC 173-303)
- Minimum Standards for Construction and Maintenance of Wells (WAC 173-160)
Regulation and Licensing of Well Contractors and Operators (WAC 173-162)
- State Clean Air Act (RCW 70.94)
- Washington Industrial Safety and Health Act Regulations (WAC 296-62)
- Water Pollution Control Act (RCW 90.48)
- Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201A)
- Water Quality Standards for Groundwater of the State of Washington (WAC 173-200)
- Underground Injection Control (WAC 173-218)
- Maximum Environmental Noise Levels (WAC 173-60)

- Shoreline Management Act of 1971 (RCW 90.58)

Local Requirements

- Kitsap County Grading Permit and other regulations, codes, and standards
- Puget Sound Clean Air Agency Regulations

All actions carried out by Ecology or Ecology's contractor must be done in accordance with all applicable federal, state, and local requirements, including requirements to obtain necessary permits, except as provided in RCW 70.105D.090. The permits or other federal, state or local requirements that the agency has determined are applicable and that are known at this time are listed above. Under RCW 70.105D.090(1), Ecology and its consultants are exempt from the procedural requirements of Chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 RCW and of any laws requiring or authorizing local government permits or approvals. However, Ecology and its consultants shall comply with the substantive requirements of such permits or approvals. During remedial action, Ecology and its consultants must continue to determine whether additional permits or approvals addressed in RCW 70.105D.090 (1) would otherwise be required for the remedial action under the Consent Decree. Ecology will be responsible for contacting the appropriate state and/or local agencies and working with those agencies to determine the substantive requirements those agencies believe are applicable to the remedial action. Pursuant to RCW 70.105D.090(2), in the event Ecology determines that the exemption from complying with procedural requirements of the laws referenced in RCW 70.105D.090(1) would result in the loss of approval from a federal agency that is necessary for the State to administer any federal law, the exemption will not apply and Ecology and its consultants will comply with both the procedural and substantive requirements of the laws referenced in RCW 70.105D.090(1) including any requirements to obtain permits.

3.0 PROPOSED CLEANUP ACTION

3.1 DESCRIPTION OF PROPOSED CLEANUP

The alternative selected in the RI/FS consists of:

- Excavating the majority, but not all, of the contaminated soil in the area shown on Figure 12, and transporting it to an offsite disposal facility. Contaminated soils beneath the store building would not be excavated. Clean soils encountered in the excavation would be temporarily stockpiled on store property or on an adjoining property until it could be used to backfill the excavation.
- Implementing an enhanced bioremediation system beneath the store building and outside the periphery of the excavation to address residual ground water contamination. The system would also address contaminated soils below the store building (most of the contaminated soil should be below the water table)
- Installing a passive venting system beneath the store building to reduce the potential for soil vapor intrusion into the building.
- Replacing the 8" water main through the Site, and repaving Twin Spits Rd.
- Implementing an extended period of ground water monitoring to track and confirm cleanup.

3.2 RATIONALE FOR SELECTION

Each of the four alternatives discussed in the RI/FS represented permanent cleanup actions and were essentially equivalent in terms of environmental protection. Variations between the alternatives occurred primarily in cost, construction considerations, and impact on the general store. The relative benefits of the alternatives were close, but the partial excavation alternatives (Alternatives 3 and 4) had the edge over the full excavation alternatives (Alternatives 1 and 2) in both benefit and cost. The full excavation alternatives included moving the general store so that the contaminated soil beneath the building could be removed; the partial excavation alternatives did not include moving the building.

Alternative 4 was slightly more beneficial but also slightly more costly than Alternative 3 with a similar benefit score. Alternative 4 was chosen because it addressed soil vapor risk immediately rather than at some point in the future. Alternative 4 also included immediate cleanup of the majority of contaminated soil at the Site, and provided for eventual cleanup of the ground water.

4.0 CLEANUP ACTION WORK ELEMENTS

4.1 ENGINEERING PLANS AND SPECIFICATIONS

Plans and specifications will need to be developed to guide the cleanup action and to serve as the basis for bidding the work to a remediation contractor. The remediation work will be bid in accordance with Ecology's current contractor procurement process. The engineering work will include the following elements:

- Preparing a surveyed base map of the Site and of the surrounding area.
- Completing refined cost estimates for Alternatives 1, 2, 3, and 4 to confirm the relative costs estimated in the Feasibility Study.
- Completing an engineers' estimate of cost for the remedial action following completion of the plans and specifications.
- Researching disposal options and costs for the contaminated soil.
- Coordinating with Kitsap County PUD on replacing the 8" AC water line.
- Coordinating with Kitsap County on the requirements for repaving Twin Spits Rd.
- Preparing plans and specifications suitable for bid purposes. The plans and specifications will include provisions for temporary erosion and sediment control; soil excavation; clean and contaminated soil management; store building shoring; excavation dewatering and backfilling; traffic control; access to the general store; utility rerouting; road repaving, new water main installation; passive soil venting system installation; enhanced bioremediation system installation; and Site restoration.
- Preparing final record drawings for the Site

4.2 PERMITTING, PUBLIC NOTICE, AND PROPERTY ACCESS

Ecology will coordinate with relevant federal, state, and local agencies regarding permits that would be normally needed for the cleanup action. In most cases Ecology will not be required to obtain the permits, but will need to meet the substantive requirements of the permit. Among the consultations that will be required are discussions within Ecology regarding shoreline management regulations, with Kitsap County regarding grading and street use permits, and perhaps with the Washington State Department of Fish and Wildlife regarding impacts to the tidally influence drainage ditch.

Public notice and participation will be provided in accordance with MTCA WAC 173-340-600. Both the RI/FS document and this CAP will be available for public review and comment. The comment period will be a minimum of 30 days, and a public meeting will be held if ten or more persons request such a meeting.

Completing this cleanup will require access to the properties adjoining the general store property. These include the church property, Kitsap County right-of-way, the Captain's Landing property, and possibly the property between the store and the shoreline. Legal access agreements will need to be executed between Ecology and the property owners.

4.3 CONSTRUCTION MOBILIZATION

The following activities are envisioned to be part of construction mobilization:

- Prepare construction plans including a Health and Safety Plan (HASP), Work Plan, and a Surface Water Pollution Prevention Plan (SWPPP)
- Provide for temporary power
- Place a temporary work trailer on or near the Site
- Place signs announcing the construction activities
- Construct a clean soil and contaminated soil holding and transport area
- Construct a decontamination facility for Site equipment and construction personnel
- Mobilize equipment and materials to the Site
- Install temporary construction fencing
- Re-route utilities within the construction area
- Install TESC and SWPPP features
- Provide an access route to the general store

4.4 SOIL EXCAVATION AND BACKFILL PLACEMENT

This work element includes excavating soil to a depth of about 7 feet, and placing it either on the clean stockpile or in the contaminated soil area.

The approximate volume of soil requiring excavation is 2100 cubic yards (including the former excavation backfill), as measured over an area of 180 ft by 45 feet in plan dimension, and extending to a depth of 7 feet. Of this quantity, about 50% should not be contaminated at concentrations above cleanup levels. The total volume requiring treatment or disposal is therefore an estimated 1050 cubic yards, which would expand to about 1400 cubic yards, assuming a 30% "fluff factor". The total weight of this volume is estimated to be 1550 tons, assuming an in-place density of 110 lbs/cu ft.

The following activities are envisioned to be part of this work activity.

- Strip the road pavement and base course and stockpile it for recycling or other use.
- Sequence the excavation to allow one lane of traffic at all times, and backfill the road area as soon as practicable for safety purposes.
- Excavate clean near-surface soils and clean backfill from the former UST area and stockpile it for later reuse.
- Excavate remaining contaminated soils to a depth of 7 feet, about 2 to 3 feet below the water table, and place it in the contaminated soil management area for disposal.
- Prevent surface water flow into the excavation and provide for dewatering as necessary to excavate soils below the water table.
- Backfill most of the excavation with structural fill – imported granular pit run or excavated sand compacted to 95% of it's maximum dry density - in order to provide support for Twin Spits Rd.

- Backfill the area adjoining the store building with controlled density fill or some other structural material to prevent excessive foundation settlement. Alternatively, sheet piling could be installed along the length of the store to provide the structural support.

4.5 TRAFFIC CONTROL

As already mentioned, the construction work will need to be conducted and managed such that at least one lane of traffic is open at all times. Both lanes of traffic will need to be open when the construction work is not underway, such as during the evening or on weekends.

4.6 CONSTRUCTION DEWATERING

Some construction dewatering will be necessary to excavate below the water table. Disposal options include: (1) Temporary storage onsite (or nearby), treatment, and then transport of the treated water to a publicly owned treatment works (POTW) or a private facility, (2) The same as #1, without treatment, and (3) Temporary storage onsite followed by treatment and discharge of the treated water to the Hansville Rd ditch or directly to Admiralty Inlet. The third option would require at least an NPDES permit, which could be difficult to get. An initial costing and evaluation of disposal options will be conducted so as to establish which are feasible. The final choice would then be up to the remediation contractor.

4.7 CONTAMINATED SOIL MANAGEMENT AND DISPOSAL

Contaminated soil will need to be managed and a disposal method selected. There are two options for soil disposal: (1) Transport to an offsite permitted disposal facility, or (2) Solid phase treatment on land near the Site, followed by disposal of the treated soil somewhere in the local area.

Of the two, transport to a treatment facility is the most straightforward. There are two fairly close soil disposal facilities – Olympic View Transfer Station located south of Bremerton, and the Rinker pit in Snohomish County. There are also manufacturing facilities that will accept contaminated soil as feedstock. One such company in Seattle, Lafarge, is a cement manufacturer.

An initial costing of disposal options will be conducted as part of preparing the engineering plans so as to establish which are feasible. The final choice would then be up to the remediation contractor.

The other activities associated with this work element include the following:

- Constructing a bermed contaminated soil stockpile area. The base of the stockpile area will need plastic sheeting to prevent mixing of the contaminated soil with clean underlying soil.
- Preventing surface water run-on into and surface water run-off out of the bermed area
- Preventing contaminated soil from escaping during truck loading operations
- Handling contaminated water drainage from soils excavated from below the water table

4.8 WATER MAIN INSTALLATION

An estimated 200 feet of new water main will be installed through the Site. The water main will need to meet engineering specifications provided by the Kitsap County PUD. Side connections serving the general store and the church will also need to be repaired and reinstalled, as necessary.

4.9 ENHANCED BIOREMEDIATION SYSTEM INSTALLATION AND OPERATION

Enhanced bioremediation involves introducing solutions containing oxygen, nutrients, and/or microbes into the saturated soil that accelerate natural attenuation processes. This technology is primarily useful for remediation of ground water and soil below the water table, and has the advantage of being relatively inexpensive and easy to implement. It also creates little disruption at the surface, and is a good choice where contamination can not be physically removed (such as beneath the store and in areas where contaminated soil has already been removed). The primary disadvantage is difficulty in establishing a uniform distribution of bioremediation solution within the contaminated area, particularly for heterogeneous geologic conditions and subsurface soils that contain significant silts or clays. Fortunately the marine sands at this Site are permeable and fairly homogeneous, and should allow for a relatively uniform distribution of bioremediation fluids.

The specific number, location, and scheduling of injection points will be established in the engineering plans and specifications, as will the selection of a specific bioremediation solution. However, the following items are envisioned to be part of this work element:

- The bioremediation remediation will include multiple injections, rather than one, to speed up the process and reduce the time required for the Site to meet cleanup levels.
- Injection points could include a grid of individual wells or a network of horizontal perforated drain pipes. A drain pipe system could be installed during backfilling of the contaminated soil excavation, and would have the advantages of a larger area of contact between solution and soil/ground water and a reduced number of injection fill ports.
- The injection points would be in the area of contaminated ground water beyond the perimeter of the excavation area. Ground water flow outward from the excavation would spread the bioremediation fluids into downgradient areas of contamination.
- Post-construction ground water monitoring would be implemented to track contaminant reduction in the plume. Ground water is expected to meet cleanup standards within two years.

4.10 PASSIVE SOIL VAPOR VENTING SYSTEM

A passive venting system will be implemented at the general store to dissipate soil vapor arising from contaminated soil and ground water beneath the store building. The system will remain in operation until compliance monitoring data indicates no further threat to indoor air quality.

There are several possible systems that could be implemented. The simplest would be to increase the number and size of foundation vents to allow free movement between the air in the crawl space and the outside air, and to cover the native soil floor of the crawl space floor with plastic sheeting or some other impermeable material. These actions would be coupled with a survey of the store to identify cracks or openings that would allow air to migrate from the crawl space into the store. Any such openings would be sealed, to the degree possible.

Another possibility is to install a series of vertical soil vapor collection wells or horizontal collection piping in a trench along the southeastern edge of the store just outside the edge of the soil excavation. This would be the area of greatest residual soil and ground water contamination, and thus the area with highest soil vapor concentrations. The wells or piping would connect with a vertical riser that would discharge to the atmosphere. The system would provide a higher permeability conduit for soil vapor to reach the surface, and would be particularly effective during periods of falling barometric pressure. The risk of vapor intrusion is greatest when barometric pressure falls - contaminated soil gases rise upwards during this period in response to the pressure differential between air in the ground and the atmosphere. The piping system could be enhanced with additional piping runs installed horizontally beneath the store.

The specific soil venting system will be established in the engineering plans and specifications. However, the following items are envisioned to be part of this work element:

- A visual survey will be made of the building structure, crawl space, and foundation vents to evaluate the feasibility of improving air flow in the crawl space.
- A field survey will be conducted with an organic vapor meter (PID - photoionization detector, or OVA - organic vapor analyzer) to check for soil gas emissions.
- Periodic monitoring will be conducted of the crawl space and/or the exhaust stack for a collection system.

4.11 SITE RESTORATION AND REPAVING

The surface of the Site will be restored to its' original condition or improved during or after the construction work is completed as follows:

- Any damage to the general store will be repaired and the affected area repainted as necessary.
- All construction equipment, materials, and facilities will be removed.
- Road signs removed for the construction will be re-installed.
- Unpaved areas that have been disturbed will be seeded or otherwise protected against erosion
- Twin Spits Rd will be repaved and restriped per the plans and specifications.
- Other paved areas that existed prior soil excavation on the church or store property will be re-paved.
- Utilities disconnected during the construction work will be reconnected.

5.0 COMPLIANCE MONITORING

5.1 PROTECTION MONITORING

Health and safety measures are required for construction workers and others visiting the site. Measures necessary during construction will be covered in a health and safety plan prepared by the construction contractor. Measures necessary for pre-construction and post-construction monitoring will be covered in a health safety plan prepared by the monitoring contractor. Each of these plans will include several different kinds of monitoring, including possibly air quality monitoring, medical history tracking, visual/odor identification, and soil or water chemical analyses.

5.2 SOIL CLEANUP CONFIRMATION

Collection of confirmation soil samples from the base and sides of the remedial excavation will be necessary to confirm that remaining soil meets cleanup levels. Specific sampling locations, methods, and analyses will be detailed in a Compliance Monitoring Plan. Details will include sample collection methods, sampling decontamination methods, analytical methods and associated detection limits, quality assurance/quality control methods, and the number and location of samples.

The chemical analyses necessary for the confirmation samples can be accomplished at a fixed-facility laboratory, or at a mobile laboratory at the Site. The advantage of an on-site laboratory is rapid sample analysis and quick feedback to the contractor on whether excavation must continue or can cease. Because of the need to keep the excavation open as short a time as possible at this site, a mobile laboratory will be used to guide the excavation, with final compliance samples submitted to a fixed-facility laboratory.

5.3 SOIL AND GROUND WATER DISPOSAL PROFILING

The permitted disposal facility ultimately selected to receive contaminated soil or contaminated water will require data showing the type and concentration of contaminants present. It will be the responsibility of the remediation contractor or the monitoring contractor to coordinate with the disposal facility and to obtain and provide the necessary chemical data.

5.4 GROUND WATER MONITORING

Pre-construction ground water monitoring will be necessary to confirm current conditions and post-construction monitoring will be necessary to confirm ground water has met cleanup levels. Specific sampling locations, methods, and analyses will be detailed in the Compliance Monitoring Plan. Post-construction monitoring will include at least four ground water monitoring wells, sampled quarterly for at least one year.

6.0 REFERENCES

Ecology, 2010, *Remedial Investigation/Feasibility Study, Hansville General Store, Hansville, Washington, Draft – For Public Comment*, Washington State Department of Ecology, February 1, 2010

Washington State Superior Court, 1992, *Consent Decree, State of Washington, Department of Ecology v. Joanne Elise Erickson and Gary E. Erickson*, and Order No. 92 2 01398 5
Entering Consent Decree, July 16, 1992

REF

FIGURES

DRAFT

Figure 1
Area Map

Draft



Draft



Legend

 Approximate Site Boundary

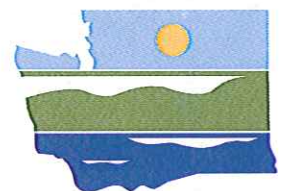
Figure 2
Vicinity Map
Hansville General Store



0 350 700
Feet

Source:
Air Photo - Kitsap County 2007
Roads - TeleAtlas

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Legend



-  Approximate Site Boundary
-  Buried Culvert

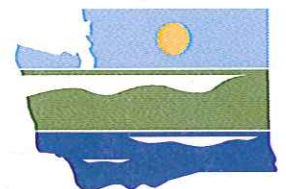
Figure 3
Area Features
Hansville General Store



0 140 280
Feet

Source:
Air Photo - Kitsap County 2007
Roads - TeleAtlas

N:\TCP\STAFF\lanM\09109_HansvilleStore_mark\mxd\figure3.mxd 1-11-2010



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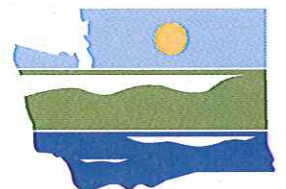
Legend

- Approximate Site Boundary, queried where uncertain
- Excavation Area, Ecology, 1994
- Excavation Area, Parametrix, 1989
- Former UST Location
- 8" Diameter Water Main
- Abandoned Wooden Drainage Culvert
- Buried Culvert

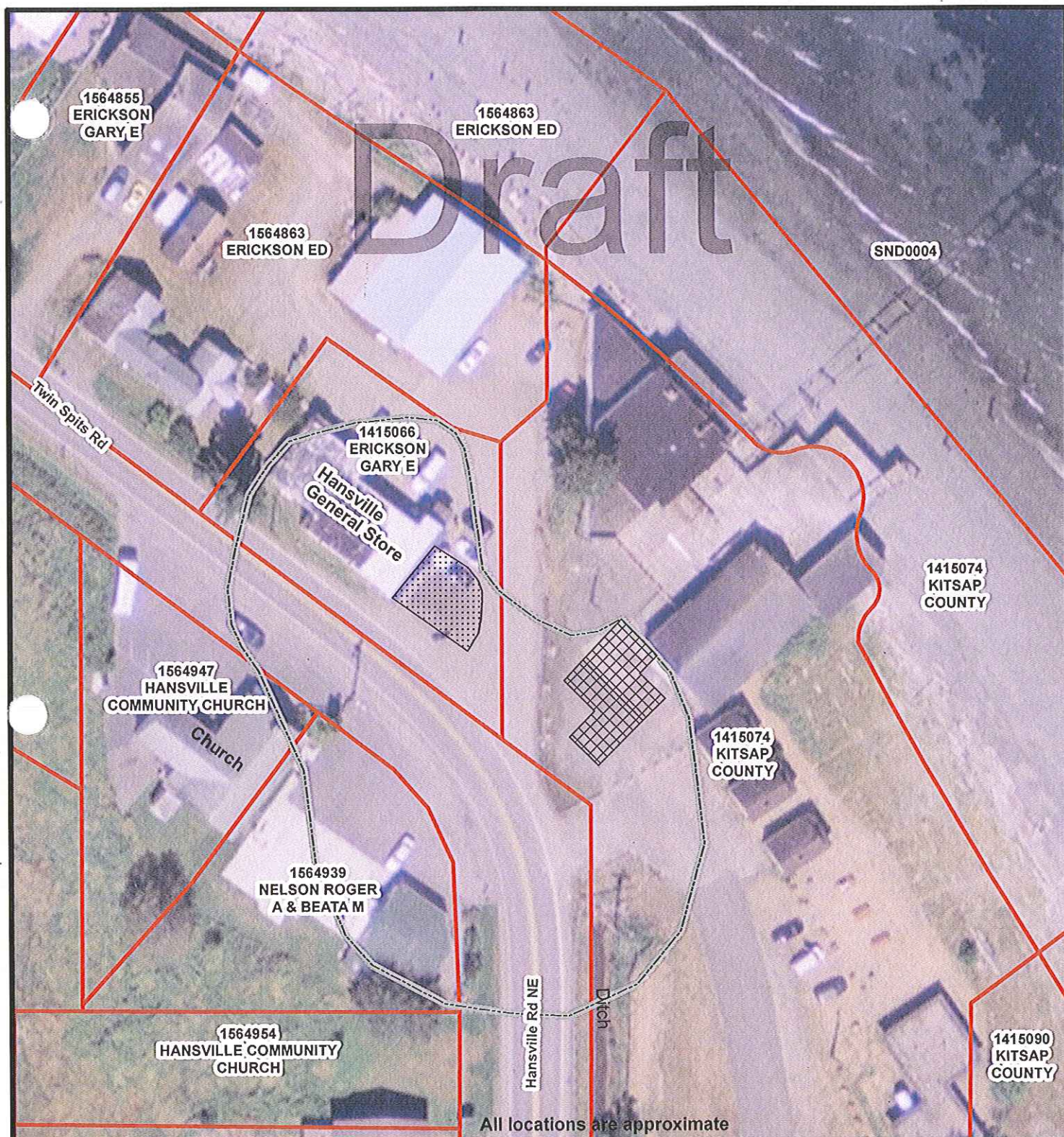
Figure 4a
Site Plan
Hansville General Store



0 30 60 90
Feet



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All locations are approximate

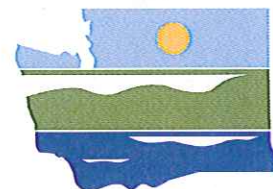
- Parcels
- Approximate Site Boundary
- Excavation Area, Ecology, 1994
- Excavation Area, Parametrix, 1989

The parcels shown on this figure have not been surveyed. This figure is intended to only show the general relationship of the properties on this site. Please refer to <http://www.kitsapgov.com/assr/PP/disclaimer1.htm> for more information on Kitsap County data.

Figure 4b
Parcel Map
Hansville General Store



0 30 60 90 120
Feet



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